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Gypsy Moth Manual

Survey Section

Detection Survey

Contents

Introduction

The purpose of a detection survey is to determine by trapping (1) where isolated infestations of gypsy moth occur and (2) where further delimiting **Regulated Area** surveys are required. Well-managed detection surveys will find isolated infestations of gypsy moths as soon as possible after introduction; small infestations of gypsy moth are less expensive and easier to eradicate than large infestations.

Not all areas within a State have the same potential for becoming infested due to differences in habitat, host availability, and the movement of **Regulated Articles** from infested areas. The risk of potential introduction will determine the areas in which a detection survey is needed. High-risk areas should include areas receiving Regulated Articles and containing preferred host trees. Before conducting the detection survey, the first task is to categorize areas within the State in regard to risk of infestation.

The months in which a detection survey will start and end will depend upon the climatic conditions in the locality. Generally, detection surveys are started in late spring and continue until early autumn. Because pheromone traps in host trees are used in the typical detection survey, only male gypsy moths are trapped. Male moths emerge earlier than female moths. The male-attracting lure has no competition until the female moths emerge approximately 1 week later than the males. Therefore, the timing of the trap survey is critical; to be fully effective, traps must be in place before the female moths emerge.

Depending on seasonal weather conditions, male emergence will vary in an area by up to 10 days.

Materials Needed for a Detection Survey

The following is a list of materials needed to conduct a detection survey (you may not need all items listed):

- Colored pencils for mapping moth finds
- County or city road maps
- Delta Traps
- First aid kit
- Grid overlay, calipers, or ruler
- Disparlure (sex attractant for traps)
- PPQ Form 343 (Trapping Record) or local form
- Trap record sheets
- PPQ Form 391 (Specimens for Determination)
- Staples, staple gun, roofing nails, hammer, string—where owners won't allow nails (for hanging traps)
- Small backpack
- Snake leggings
- Surveyor's flagging ribbon (marking tape), crayon, or marker for marking trap locations
- Tick repellent

Planning the Detection Survey

The steps involved in planning a detection survey follow:

1. Step 1—Categorize Areas Within a State
2. Step 2—Determine Trapping Requirements
3. Step 3—Determine Survey Needs
   - **A.** Formula for Determining Trap Needs
   - **B.** Formula for Determining Personnel Needs
4. Prepare a Trapping Budget

Step 1—Categorize Areas Within a State (per the National Survey Plan)

Use the criteria that follow to determine the total number of square miles in each category per county. The categories will determine the density and frequency of trapping in a particular area.

NOTICE

The National Survey Plan is a minimal survey which will detect infestations before expansive land areas have to be treated. PPQ will fund this plan up to 50 percent based upon available funding. Trapping densities can be increased with additional cooperator funding (**page-3-6**).

The following pages contain the detailed criteria for determining categories.

Category 1—Areas having high potential for introduction of gypsy moth (people and/or Regulated Articles moving from infested areas into noninfested areas). The area must have a suitable habitat (host trees) to support a gypsy moth population.

Category 1 areas include the following:

- Wooded, suburban residential areas
- Affluent residential areas
- Residential areas with high amount of relocations
- Cities with military bases or major universities

EXAMPLE: Counties surrounding large metropolitan areas such as Chicago, San Francisco, Louisville, Atlanta, Raleigh, and Portland

For Category 1, the trapping density and frequency are as follows:

Trapping density:	One trap per square mile
Trapping frequency:	Every 2 years

Category 2—Areas having moderate potential for introduction of gypsy moth. The area has a suitable habitat (host trees) to support a gypsy moth infestation.

Category 2 areas include the following:

- Contiguous wooded areas that are accessible to people
- Areas with moderate populations such as small cities
- Large, urban areas with limited habitat

EXAMPLE: Blue Ridge areas of Virginia, West Virginia, Tennessee, North Carolina, and Georgia. Ozark areas of Missouri and Arkansas

For Category 2, the trapping density and frequency are as follows:

Trapping density:	One trap every 4 square mile (0.25 traps per sq. mi.)
Trapping frequency:	Every 2 years

Category 3—Areas with a low risk of introduction and a suitable habitat to support an infestation.

Category 3 areas include the following:

- Rural agricultural areas with widely scattered small towns
- Noncontiguous wooded areas

EXAMPLE: The corn belt areas of Iowa, Illinois, Indiana, and Ohio

For Category 3, the trapping density and frequency are as follows:

Trapping density:	One trap every 4 square mile (0.25 traps per sq. mi.)
Trapping frequency:	Every 4 years

Category 4—Areas with a lack of habitat or potential for introduction.

EXAMPLE: Great Plains grassland/wheat areas, semiarid high desert areas, and dry desert areas

For Category 4, the trapping density and frequency are as follows:

Trapping density:	None of these areas should be trapped
Trapping frequency:	NA

Category S (Special Site)—Sites where infestations are most likely to be artificially introduced.

These are sites that have a history of receiving Regulated Articles from generally infested areas and also are exposed to movement of infested vehicles (for example, mobile homes, recreational vehicles) from generally infested areas.

Category S areas include the following:

- Saw mills and veneer mills
- Nurseries
- Mobile home parks
- State and Federal parks
- Campgrounds
- Tourist attractions

For Category S, the trapping density and frequency are as follows:

Trapping density:	Random set (no more than four traps per site or per square mile)
Trapping frequency:	Every 2 years

Step 2—Determine Trapping Requirements

Plan to trap for gypsy moth in all categories except Category 4.

When determining trapping requirements, consider the frequency for trapping an area and the last time the area was trapped. If an area must be trapped every 2 years and the area was trapped last year, do not trap the area in the current year.

Step 3—Determine Survey Needs (Personnel and Supplies)

The following formulas will determine trap needs and personnel for survey activities:

Step 3a—Formula for Determining Trap Needs

Number of square miles in a category multiplied by number of traps per square mile (trap density). Divide the total by the trapping frequency (in years) to get the number of traps required per year.

$$\frac{\text{\# sq. mi. x trap density (\# traps per sq. mi.)}}{\text{trapping frequency in years}} = \text{total no. of traps required}$$

EXAMPLE: Figure trap needs for Category 1 which is 250 sq. mi. in total area.

$$\frac{\text{250 sq mi x 1 (\# traps per sq mi)}}{\text{2 (trapping frequency)}} = \frac{250}{2} = \text{125 traps}$$

For a Category 1 area which is 250 sq. mi. and trapped every two years, 125 traps are needed.

Step 3b—Formula for Determining Personnel Needs

Divide the trap total by the number of traps a trap tender can service under the conditions experienced in a specific State. For detection surveys, a national average is 400 traps per trap tender. In mountainous areas, because of the terrain, the average falls to 250 traps per trap tender. (For delimiting surveys, the average is 750 traps per trap tender; for transition zone surveys, the average is 600 traps per trap tender.)

$$\frac{\text{trap total (= total number of traps)}}{\text{\# of traps a trap tender can service}} = \text{total trap tenders required}$$

EXAMPLE: Figure how many trap tenders to hire for the season when conducting a detection survey that requires 1,200 traps.

$$\frac{\text{1,2000 traps (traps requiring service)}}{\text{400 (\# of traps a trap tender can service)}} = \text{total no. of traps required}$$

Step 4—Prepare a Trapping Budget

After determining the needed traps and trap tenders, prepare a trapping budget.

Budget for the following expenses (adjust for inflation, for example, pay and mileage increases).

- Trap tenders' hours
- Transportation costs for trap tender
- Trap and lure cost
- Other materials (staples, staplers, nails, hammers, maps)

If the criteria of the National Survey Plan (guidelines covered in this manual) are followed, APHIS pays half the cost of the survey; the State pays the remaining half.

EXAMPLE: You're going to hire six trap tenders to service 2,550 traps and you need to determine costs. Using the above assumptions in figuring costs, calculate salary, mileage, traps and a total.

Therefore, APHIS pays $15,765 toward the survey cost (its half) while

Salary:		
440 hours/person x 6 trap tenders x $6	=	$15, 840.00
Mileage:		
7,000 miles x 6 trap tenders x $0.32½	=	$13,650.00
Traps:		
2,550 traps x $0.80	=	+ 2,040.00
Total		$31,530.00

the State pays the remaining $15,765 ($31,530 divided by 2).

If the States cannot contribute their half, then PPQ will still pay half of the cost of the survey at National Survey Plan levels. In our preceding example, the State should pay $14,190--its half of the cost. But if the State could only contribute $7,000 (roughly one-quarter of the cost), then APHIS would still pay $14,190. As a result, the total funding toward the survey is only $21,190 (roughly three-quarters of the total cost). So, the density or survey traps or the frequency of trapping must be cut by one-quarter unless funds could be found elsewhere.

Trapping cannot exceed the level of funding.

If the States want to increase trapping density or frequency beyond the National Survey Plan, then the State must bear the additional costs above their 50 percent.

Conducting the Detection Survey

Here is an overview of the steps involved in conducting a detection survey:

1. **Plot Trap Locations on a Map**
2. **Select Sites for Placing Traps**
3. **Set Traps and Mark Locations**
   - **A.** Setting Traps
   - **B.** Marking Trap Locations
4. **Check the Traps**
5. **Submit Gypsy Moth Suspects**
6. **Remove Traps**
7. **Report Survey Results**
8. **Complete Survey Maps**
9. **Interpret Survey Results**

Step 1—Plot Trap Locations on a Map

Plot trap locations well in advance of the survey season (late winter/early spring). Overlay a uniform grid on a map and mark the grid points. Using a grid to plot trap locations is important for ensuring proper trap distribution. Plotting the trap locations on planned grids allows for comparison of results from location to location. Randomly placed traps are effective only when trapping special sites (Category S—campgrounds, tourist attractions, rest stops, recreational areas).

When plotting trap locations on the map, consider the scale of the map and the trapping density required (for example, Category 1 requires one trap per square mile so you would plot a trap every square mile).

Devise a system to ensure proper trap distribution. Use a grid, a ruler, or calipers to plot trap locations on a map. Following the square mile blocks on most county or city maps is also a good system.

The scale on a county map is appropriate for the detection survey.

The following table shows distances for various trap densities.

TABLE 3-1: Distances for Various Trap Densities

Traps per Square Mile	Distance Between Traps (In feet)
0.25	10,560
1.00	5,280

Once you have plotted trap locations on the map, number the traps. Number each trap consecutively within a county. Mark the trap number clearly on the map.

The following figure shows traps plotted for a detection survey.

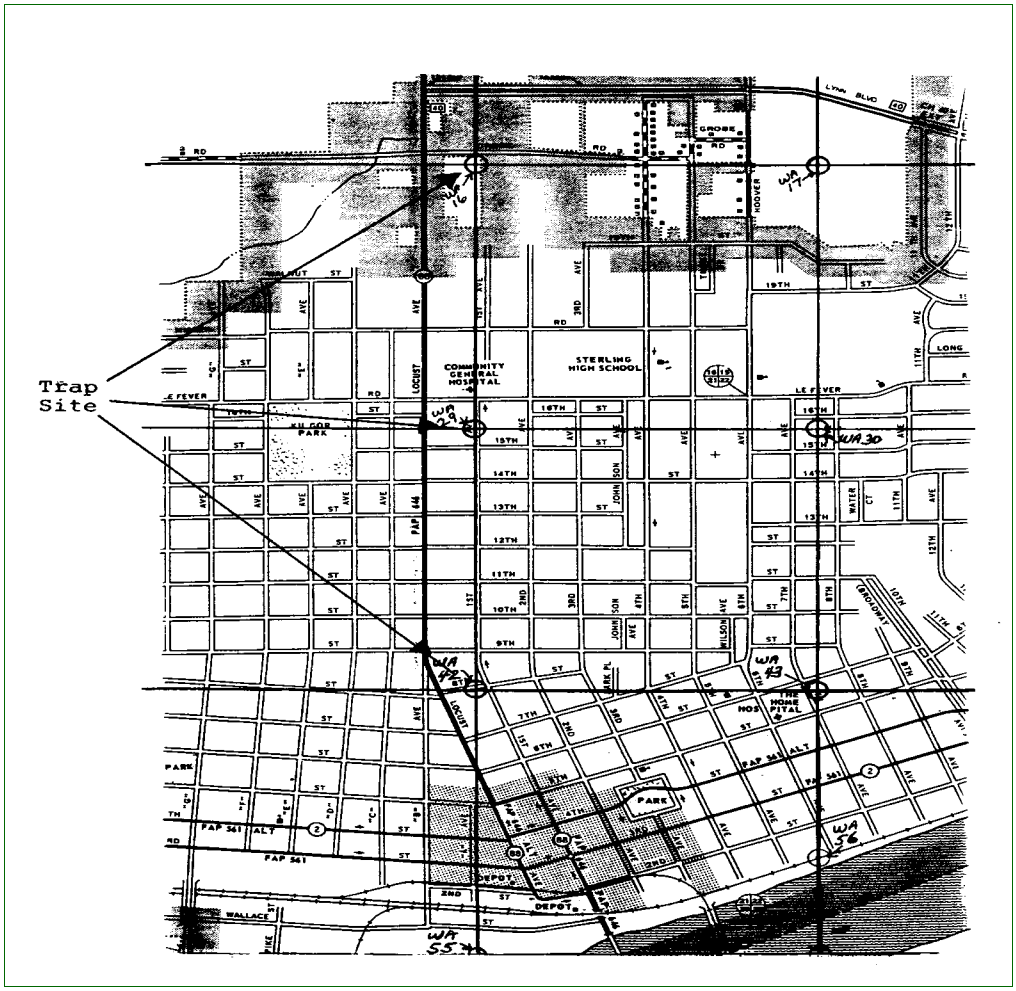

FIGURE 3-1: Example of Traps Plotted for Detection Survey

Step 2—Select Sites for Placing Traps

Using the map with the trapping sites plotted, select individual trap site as close to the plot location as possible. Try to place all traps on preferred hosts. Host trees are grouped according to gypsy moth preference and are as follows:

Step 3—Set Traps and Mark Locations

TABLE 3-2: Hosts Preferred by All Larval Instars

◆ Apple	◆ Boxelder	◆ Speckled alder
◆ Aspen	◆ Larch	◆ Sweet gum
◆ Basswood	◆ Linden	◆ Willow
◆ Birch (except yellow and black)	◆ Mountain ash	
	◆ Oaks (all types)	

TABLE 3-3: Non-preferred Hosts

◆ Beech	◆ Hemlock	◆ Pine
◆ Blueberry	◆ Locust	◆ Spruce
◆ Chestnut	◆ Maple	

TABLE 3-4: Hosts Larvae Avoid

◆ Arborvitae	◆ Cottonwood	◆ Juniper
◆ Ash	◆ Dogwood	◆ Poison ivy
◆ Azalea	◆ Elder	◆ Red cedar
◆ Balsam fir	◆ Currant	◆ Sycamore
◆ Black walnut	◆ Grape	◆ Tulip poplar
◆ Butternut	◆ Holly	◆ Yellow poplar
◆ Catalpa	◆ Honeysuckle	
◆ Cedar	◆ Horsechestnut	

Step 3a—Setting Traps

The timing for setting traps is critical. Set traps before male moths emerge. One way to gauge the date to have all traps set is to determine the earliest date “native” moths were caught in previous years.

Remove lure from its package 1 week before use in the field. Lures exposed to air before field use are more effective in trapping moths.

Directions for assembling traps are in **Appendix E**.

The approximate locations of traps are already marked on a map. Use discretion in selecting the exact location of the traps. Many factors determine where to set a trap in a given area.

General Rules for Setting Traps

Consider the following general rules when setting traps.

1. Male moths usually follow woodland edges and lines of tree growth. Moths do not frequent open areas where there are no trees or shrubs.
2. If available, woodland edges are the best sites for trap placement. Traps are most effective when placed at or near a woodland corner. If there is a choice, place the trap on the windward side so the prevailing wind currents will carry the scent (pheromone) into the woods.
3. If there are no woodlands or residential sites within a reasonable distance (500 to 1,000 feet) from the plotted map location, then the best location for a trap is at the end of a hedge row or tree leading to a wooded area.
4. Place traps 4 to 5 feet high (or eye level if less than 5 feet) on tree trunks because most flight occurs near ground level. In areas frequented by small children or cattle, place the trap out of their sight and reach. Because of vandalism and pilferage, trap placement is especially important when trapping Category S areas (such as recreational parks, campgrounds, and tourist attractions).
5. If possible, place traps in shady areas. Do not set the trap where foliage or branches will block the trap openings.
6. Complete trap record including a sketch showing specific trap location.
7. Avoid setting traps on or in the following situations:
   - **A.** Close to gravel road (place trap at least 50 feet away)
   - **B.** Properties that are for sale
   - **C.** Parks or open areas where people can easily see the traps
   - **D.** Properties with aggressive dogs
   - **E.** Private property without the owner's permission
   - **F.** School properties or along passageways where students walk
   - **G.** Sites that cannot be accurately described
   - **H.** Sites where farm animals may damage or destroy traps
   - **I.** Sites where road construction is scheduled or in progress
   - **J.** Sites within locked gates

K. Sites obscured by tree branches

L. Trees having poison ivy vines

M. Trees marked for cutting or removal

The distance between traps depends on the trap density that you have selected and the extent of favored host trees available. Place the traps in a uniform array on choice hosts or in a preferred habitat.

Step 3b—Marking Trap Locations

Mark trap locations to expedite trap tending as well as supervision. Use plastic flagging ribbon or marking crayon. To mark a trap location, tie a piece of flagging ribbon to a telephone pole, tree trunk, or other suitable object at the roadside. The ribbon should be visible from the road when approaching from either side. Mark trap location only when necessary because it might lead others to the trap causing vandalism.

Brightly colored plastic tape (fluorescent orange) has proven to be the best flagging ribbon. The marking crayon must be sufficiently soft to mark wet trees. Place a small piece of flagging ribbon near the trap.

In urban areas where streets are named and houses are numbered, use the house address for locating traps. Do not mark trap location with ribbons or marking crayons in urban areas. Also, use restraint in marking roadside rest areas, picnic areas, tourist attractions, and other high use areas where the ribbon will detract from the site's appearance.

Step 4—Check the Traps

Check each trap at least once during the trapping season; however, more frequent trap checking is preferred. Under ideal conditions, trap checking will start when the male moths start flying. Trap checking two weeks after the initial flight of the male moths is also desirable. Where vandalism is likely, check the traps more often.

Plan your trap checking route before you leave the office. Select a route that will eliminate overlapping travel.

When checking traps, have a supply of replacement traps to replace all vandalized and missing traps. When replacing a trap, number the replacement trap with the same number as the original trap.

Take the lure from its package 1 week before use and expose to air.

When checking traps, do the following:

1. Check overall trap condition and replace badly damaged traps.
2. When trap contains a suspect moth, remove the trap without disturbing the specimen. Note on the trap record sheet the date and exact location of recovery and tell your supervisor.
3. Record the trap inspection by noting the date on the trap and the PPQ Form 343 (Trapping Record) or local trap record sheet.
4. Write the following information on the trap: Trap numbers, county, trapper's initials, date trap set, and each date the trap is checked.

Check the traps by opening one triangle end. Look into the trap to see if there are any male moths. If a suspect male is present, remove and replace the trap. Always use lure that has been aired for 1 week. Number the replacement trap with the same number plus an indicator (such as the letter "R," for example, 416-R) that it is a replacement trap.

NOTICE

MANAGERS: To roughly delimit small infestations, be ready to move rapidly to add or move traps as needed when gypsy moths are found. (See Step 9.)

Step 5—Submit Gypsy Moth Suspects

Submit the trap with the suspect moth to your supervisor or designated identifier. Record on the bottom of the trap the date, time, results, and any pertinent observation or action taken.

Record the date and all circumstances about the catch of suspect moths on the trap record sheet. Accurate information is essential to the trapping program. Complete the form each time you check the trap and find a gypsy moth. The data you report is as important as the trap placement.

Step 6—Remove Traps

At the end of the trapping season remove all traps set and examine each for gypsy moths. Carefully look for missing traps. If a trap number cannot be read, rewrite the number on the trap. The trap number will not fade if on the bottom of the trap.

When removing the trap, remove all other materials (string, nails, lures, staples, wire) used in trapping. Also, remove all flagging tape. Give all traps removed to the person in charge of the survey. For each trap containing a suspect moth, provide the following information: Location (State, county, town), trap number, trap tender's name or identification number, date, and host tree name. Open traps on final check because moths can be missed when you just look through the

trap ends. Flatten empty, used traps and dispose of by burning in an incinerator or by burying at a sanitary landfill. Be sure to destroy the lures with the traps.

Step 7—Report Survey Results

See **Appendix F** for instructions on reporting survey data into the National Agricultural Pest Identification System (NAPIS). Do not report into NAPIS until you have all the data collected and summarized by county. NAPIS reports will summarize survey results by county.

Step 8—Complete Survey Maps

Record all positive trap catches on the survey field map. Survey maps with positive and negative finds are used for postseason review and decision making. Moth catch patterns will help when planning delimiting surveys in the next trapping season. At the end of the season, make permanent maps by transferring information from the field maps. Be neat, clear, and accurate when transferring information. It is very important that you show survey results correctly on the map.

Step 9—Interpret Survey Results

If you found gypsy moth during your survey, interpret the survey results. Trap catches of gypsy moth may warrant conducting a delimiting survey in the next year.

The decision to delimit in the following year is subject to local interpretation based on the following factors:

- Number trapped in current year
- Number trapped in previous year
- Host vegetation
- Available resources
- Potential for artificial dispersal

To help with the decision to delimit, increase trapping density to 16 traps per square mile in the immediate vicinity of a positive trap if enough time remains in the flight period and if resources permit.

For criteria and methods on delimiting, consult the reference section on the delimiting survey.

Survey Records and Maps

To document the detection survey, accurate and complete survey records and maps must be maintained.

Records

Maintain a record of all trap locations including any descriptive information needed to help locate traps (trap site map or PPQ Form 353). Include information such as date set, date inspected, and date removed, as well as trap catches. This information should be recorded on a trap record sheet.

Keep a separate record of any egg mass surveys conducted. Use local guidelines for proper record maintenance.

In developing local guidelines for survey records, determine what information is needed and the most efficient manner for recording each item.

Record all positive trap findings and verify trap location on the map.

At the end of the survey season, you must report summary results by county into the NAPIS data base. See **Appendix F** for instructions on reporting into NAPIS.

Maps

For detection surveys, county or city maps are satisfactory. The trap pattern will determine what map scale to use.

Consecutively number every trap location within each county. The type, number, and distribution of maps will vary according to local needs.

Prepare trap maps before the trapping season (the preferred method) using a grid system to assure proper trap distribution. Use a grid, calipers, a ruler, or an overlay to plot trap location. When you use the grid system of plotting trap locations before field placement, adjust trap locations in the field. Make corrections on all maps to show the actual trap locations.

When you add traps to positive trap sites, number the additional traps with the same number as the supplemented trap with a letter added. Example, if trap 25 is supplemented, the first additional trap would be 25a, the second 25b, and so on.

Staple or glue a map legend to each survey map to indicate the program starting date, completion date, name of trapper, and any other pertinent information.

When using maps for postseason decision making, show both negative and positive trap catches on the map. When determining the pattern of trap catches and establishing treatment boundaries, the negative traps are very important.

Revising Quarantine Maps

Revise quarantine maps annually on a schedule coordinated with revisions of the regulated area. Use a State map with counties outlined to show proposed revisions to the quarantine map.

Communicate quarantine revision information through channels to your Regional Office.

Regional Offices should submit proposed revisions of the maps to Program Support in Riverdale, Maryland.